

CLAIMS

We claim:

1. A system for starting an engine and generating power while the engine is running, comprising:

a permanent magnet motor that is adapted to be coupled with the engine such that the motor and the engine rotate simultaneously;

a first phase controlled rectifier associated with the motor for selectively coupling the motor to a power source for providing power to the motor from the power source during an engine starting operation; and

a second phase controlled rectifier associated with the motor for selectively coupling the motor to a load, for providing power from the motor to the load when the engine is running.

2. The system of claim 1, wherein the first and second phase controlled rectifiers are switched such that one is conducting while the other is off.

3. The system of claim 1, including a power converter associated with the first phase controlled rectifier for converting power from the source to a variable voltage, variable frequency power supplied to the motor during the engine starting operation.

4. The system of claim 1, including a DC link capacitor bank between the first phase controlled rectifier and the motor and wherein the first phase controlled rectifier controls an amount of current provided to the capacitor bank when the power source begins to provide power to the motor.

5. The system of claim 1, wherein the second phase controlled rectifier converts power generated by the motor into a constant DC voltage and including a power converter associated with the second phase controlled rectifier for converting the constant DC voltage into AC power supplied to the load.

6. The system of claim 5, including at least one filter between the inverter and the load to provide a selected power quality.

7. The system of claim 6, wherein the at least one filter comprises a differential mode filter in series with a common mode filter.

8. The system of claim 1, including a pulse width modulating converter in series with the phase controlled rectifiers for converting power supplied to the motor or received from the motor into a desired state.

9. A method of controlling power distribution using an engine starting system having a permanent magnet motor associated with the engine such that the motor and the engine rotate simultaneously, comprising the steps of:

coupling the motor to a power source using a first phase controlled rectifier while starting the engine; and

coupling the motor to a load using a second phase controlled rectifier to provide power generated by the motor to a load when the engine is running.

10. The method of claim 9, including enabling one of the first or second phase controlled rectifiers when the other is disabled.

11. The method of claim 9, including converting power from the source to a variable voltage, variable frequency power supplied to the motor while starting the engine.

12. The method of claim 9, including using the first phase controlled rectifier to control an amount of current provided to a capacitor bank between the power source and the motor.

13. The method of claim 9, including using the second phase controlled rectifier to convert power generated by the motor into a constant DC voltage.

14. The method of claim 13, including converting the constant DC voltage into AC power supplied to the load.

15. The method of claim 14, including filtering the power supplied to the load to provide a selected power quality.

16. A gas turbine engine assembly, comprising:
- a gas turbine engine;
 - a permanent magnet motor at least selectively coupled with the engine such that the motor and corresponding portions of the engine rotate simultaneously;
 - a power converter in series with the motor;
 - a first phase controlled rectifier in series with the power converter on an opposite side of the converter from the motor;
 - a second phase controlled rectifier in series the power converter between the power converter and the motor; and
 - a controller that controls the first phase controlled rectifier to couple the motor to a power source for starting the engine and enables the second phase controlled rectifier to couple the motor to a load for providing power to the load when the engine is running.
17. The assembly of claim 16, wherein the controller disables one of the phase controlled rectifiers when the other is enabled.
18. The assembly of claim 16, wherein the power converter comprises a pulse width modulating inverter.

19. The assembly of claim 16, including a filter between the power converter and the load for filtering power generated by the motor and converted by the power converter before the converted power is provided to the load.

20. The assembly of claim 19, wherein the filter provides a selected quality of power to the load.